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Arabia, Jr. et al.

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(54) **DOOR ASSEMBLY WITH ANTI-THEFT DEVICE**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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571,027 A * 11/1896 Taylor E05B 55/005
70/448
612,397 A * 10/1898 Burgess E05B 55/005
70/448

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(Continued)

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FOREIGN PATENT DOCUMENTS

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CN 201068665 Y 6/2008
CN 101555737 A 10/2009

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OTHER PUBLICATIONS

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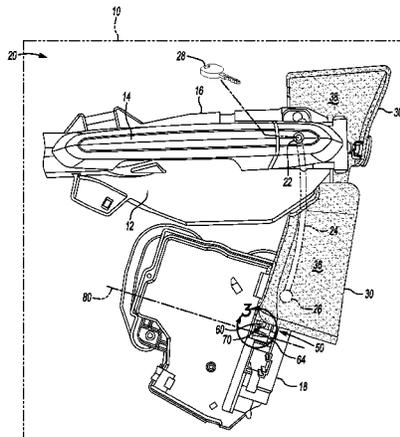
(57) **ABSTRACT**

(52) **U.S. Cl.**
CPC **E05B 77/44** (2013.01); **E05B 79/02** (2013.01); **E05B 79/12** (2013.01); **E05B 85/06** (2013.01); **B60J 5/04** (2013.01); **B60R 25/00** (2013.01)

A door assembly having an anti-theft device is provided. The assembly includes a door component defining an internally protruding cavity. A locating tab extends from the anti-theft device and is insertable in the cavity in the door component, thereby locating the anti-theft device relative to the door component. The door component includes a locking tab attached or integrally formed on the door component and adapted to snap into an opening in the anti-theft device, thereby securing the anti-theft device relative to the door component. The anti-theft device may be a shield and the door component may be a latch mechanism.

(58) **Field of Classification Search**
CPC B60J 5/0437; B60J 5/04; E05C 17/203; Y10T 70/489; Y10T 70/8459; Y10T 70/7955; Y10T 292/0822; Y10T 292/79; B60R 25/00; E06B 65/20; E05B 79/02; E05B 79/12; E05B 85/06

16 Claims, 3 Drawing Sheets



(51)	Int. Cl.			5,480,117	A *	1/1996	Fleming, III	.....	E04B 1/6183
	<i>B60J 5/00</i>	(2006.01)							248/231.9
	<i>B60J 5/04</i>	(2006.01)		5,586,796	A *	12/1996	Fraser	.....	E05B 15/0205
	<i>B60R 25/00</i>	(2013.01)							292/340
(56)	References Cited			5,636,540	A *	6/1997	Myers	.....	E05B 9/084
									24/458
				5,676,002	A *	10/1997	Hoepfner, III	.....	E05B 83/36
									292/346
				5,722,276	A *	3/1998	Aigner	.....	E05B 9/002
									292/337
				5,787,741	A *	8/1998	Shen	.....	E05B 15/02
									292/21
				5,829,799	A *	11/1998	Yamagishi	.....	E05B 81/14
									292/201
				5,855,400	A	1/1999	Ohhashi et al.		
				6,014,876	A *	1/2000	Taylor	.....	B60R 25/04
									292/346
				6,240,754	B1 *	6/2001	Petersen	.....	E05B 83/36
									292/346
				6,318,783	B1 *	11/2001	Knox	.....	B29C 65/58
									29/91
				6,322,114	B1 *	11/2001	Kurachi et al.	.....	292/341.17
				6,412,852	B1 *	7/2002	Koa	.....	B60R 13/0206
									296/146.5
				6,530,251	B1 *	3/2003	Dimig	.....	E05B 79/06
									292/336.3
				6,546,767	B1 *	4/2003	Kirejczyk	.....	E05B 83/36
									292/346
				6,676,324	B1 *	1/2004	Pleiss	.....	B60R 13/0206
									24/581.11
				6,722,170	B2 *	4/2004	Squier	.....	E05B 9/08
									292/DIG. 53
				6,725,606	B2 *	4/2004	Nishikawa	.....	B60J 5/0416
									49/502
				6,863,327	B2 *	3/2005	Granger et al.	.....	296/1.08
				6,929,309	B1 *	8/2005	Radu	.....	B60R 13/0243
									296/146.7
				6,932,416	B2 *	8/2005	Clauson	.....	B60R 13/0206
									296/146.7
				6,983,978	B2 *	1/2006	Radu	.....	B60R 13/0243
									296/146.5
				7,008,003	B1 *	3/2006	Hirose	.....	B60R 13/0206
									296/146.7
				7,024,896	B2 *	4/2006	Squier	.....	E05B 9/08
									292/DIG. 53
				7,104,575	B2 *	9/2006	Kakita	.....	E05B 85/12
									292/348
				7,111,877	B2 *	9/2006	Larsen	.....	E05B 81/14
									292/201
				7,131,685	B2 *	11/2006	Carrier	.....	B29C 45/1676
									296/146.7
				7,198,319	B2 *	4/2007	Schroder	.....	B60J 5/0416
									296/146.7
				7,347,026	B1 *	3/2008	Garcia Martin	.....	B60J 5/0416
									296/146.7
				7,393,023	B1 *	7/2008	Kelly	.....	A01K 1/0017
									292/144
				7,841,221	B2 *	11/2010	Hill	.....	E05C 9/042
									70/120
				8,007,016	B2 *	8/2011	Mantyla	.....	B01D 17/0208
									220/4.03
				8,020,904	B2 *	9/2011	Flory	.....	E05B 63/14
									292/241
				8,162,360	B2 *	4/2012	Takaya	.....	E05B 79/04
									292/336.3
				8,303,004	B2 *	11/2012	Lee	.....	E05B 77/06
									292/216
				8,407,942	B1 *	4/2013	Jones	.....	E05B 17/2084
									292/346
				8,424,926	B2 *	4/2013	Ueno	.....	H04M 1/0249
									292/58
				8,424,927	B2 *	4/2013	Tsai	.....	F16B 5/0664
									292/137
				8,567,839	B2 *	10/2013	Kalus	.....	B60N 2/466
									296/39.1
				9,061,403	B2 *	6/2015	Colombo	.....	B25B 27/00
				9,067,625	B2 *	6/2015	Morris	.....	B62D 27/023
				2001/0005080	A1 *	6/2001	Inoue	.....	292/216

(56)

References Cited

U.S. PATENT DOCUMENTS

2002/0027376 A1* 3/2002 Marcovecchio B60R 13/0243
296/146.7
2004/0094989 A1* 5/2004 Matsumoto B60J 10/0065
296/146.1
2005/0140148 A1* 6/2005 Stoof E05B 17/04
292/216
2005/0253416 A1* 11/2005 Radu B60R 13/0243
296/146.7
2006/0017306 A1* 1/2006 Smith B60J 5/0418
296/146.7
2006/0119114 A1* 6/2006 Kreitz E05B 83/36
292/346
2006/0208503 A1* 9/2006 Simchayoff E05B 15/022
292/216
2007/0023431 A1* 2/2007 Rouns B65F 1/1615
220/210
2007/0075552 A1* 4/2007 Hayakawa E05B 81/06
292/216
2007/0126245 A1* 6/2007 Feng A61G 3/0808
292/216
2007/0176434 A1* 8/2007 Joschko E05B 81/06
292/216
2007/0273160 A1* 11/2007 Fujimatsu E05B 81/25
292/216
2008/0012355 A1* 1/2008 Fujimatsu E05B 83/36
292/216
2008/0048458 A1* 2/2008 Suzumura E05B 79/08
292/216
2008/0060395 A1* 3/2008 Hanisch E05B 85/02
70/237
2008/0122229 A1* 5/2008 Choi B60R 7/04
292/216

2008/0185850 A1* 8/2008 Takaya E05B 79/04
292/336.3
2008/0272607 A1* 11/2008 Kannapell B64C 25/26
292/216
2009/0021027 A1* 1/2009 Inan E05B 85/26
292/341.12
2009/0134638 A1* 5/2009 Kutschat E05B 85/247
292/216
2009/0289464 A1* 11/2009 Pawson E05B 15/02
292/346
2010/0024193 A1* 2/2010 Hanisch 29/428
2010/0199726 A1* 8/2010 Varney E05B 17/2038
70/90
2010/0269431 A1* 10/2010 Young E06B 5/11
52/204.1
2011/0316291 A1* 12/2011 Loughlin E05B 13/001
292/101
2013/0036779 A1* 2/2013 Akizuki E05B 77/265
70/237
2013/0140846 A1* 6/2013 Montoya B60R 13/0243
296/146.7
2013/0181475 A1* 7/2013 Torii B60J 5/0413
296/146.7
2014/0035322 A1* 2/2014 Sakhara B62D 25/02
296/187.12
2014/0265430 A1* 9/2014 Choi B60J 5/047
296/146.7
2015/0143859 A1* 5/2015 Beck, Jr. F16B 41/005
70/431

FOREIGN PATENT DOCUMENTS

DE 19511294 A1 10/1996
DE 29909260 U1 8/1999

* cited by examiner

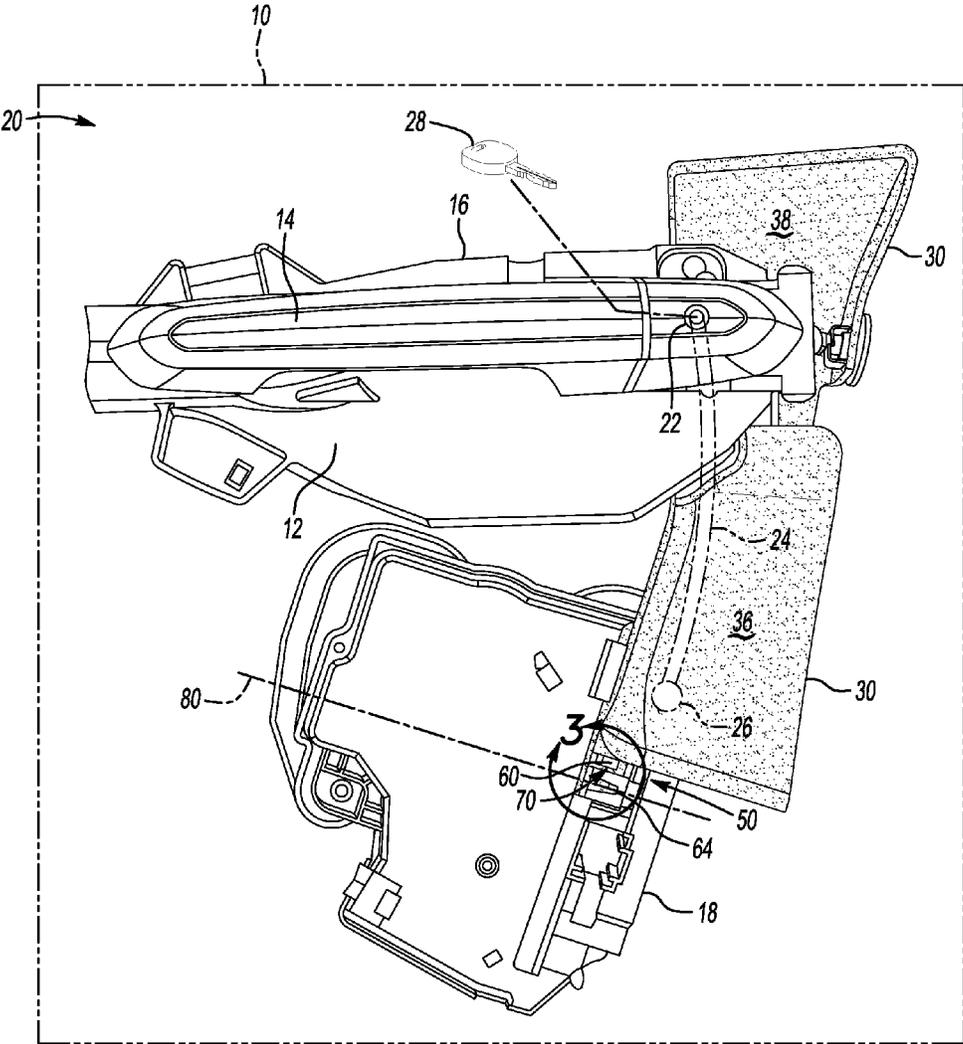


Fig-1

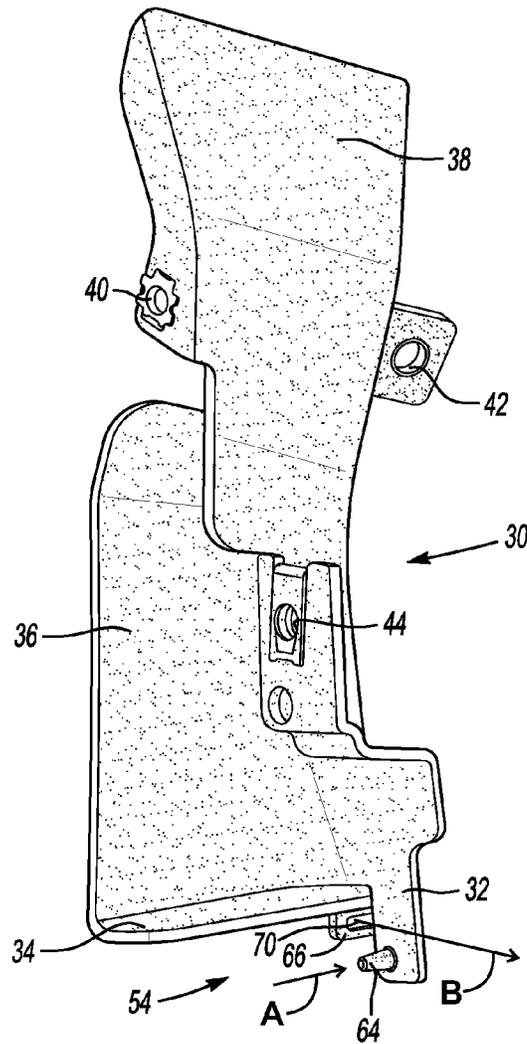


Fig-2

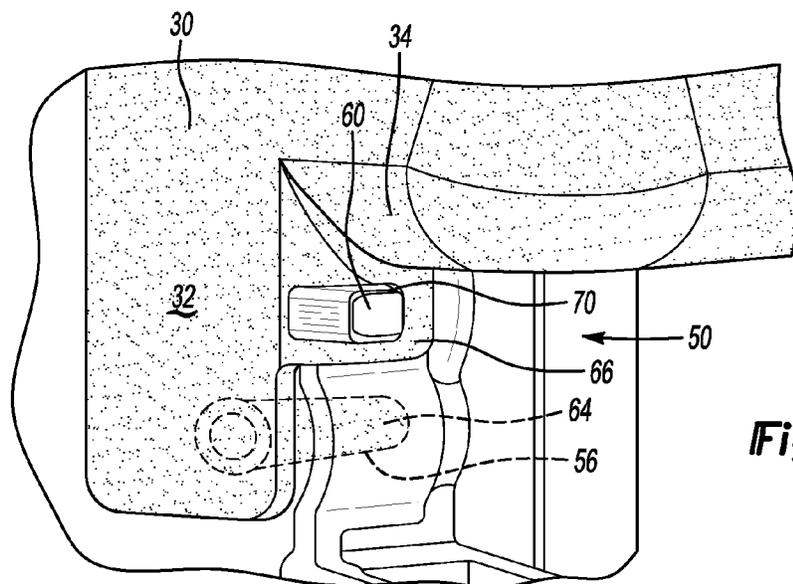


Fig-3

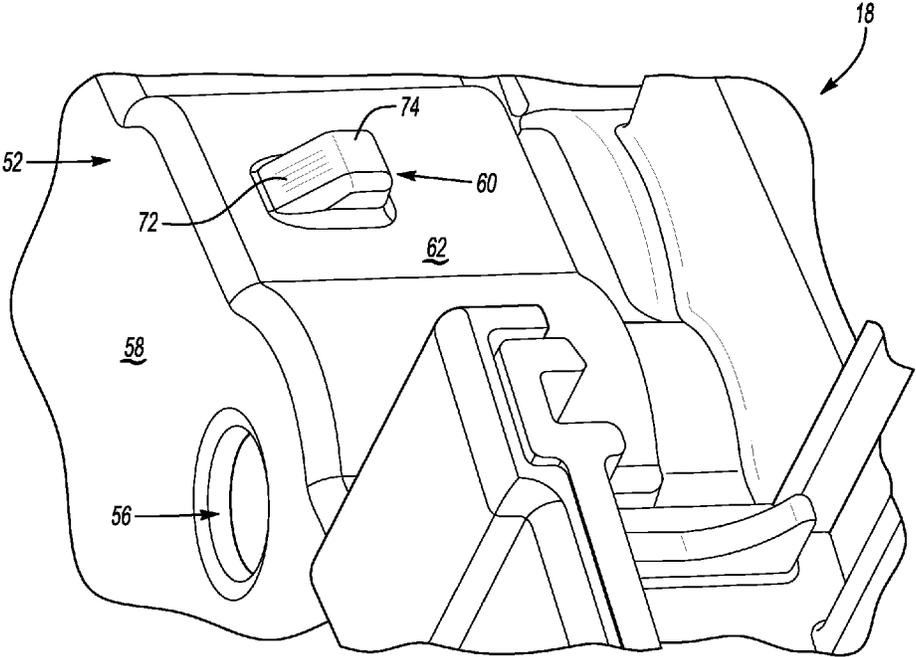


Fig-4

DOOR ASSEMBLY WITH ANTI-THEFT DEVICE

TECHNICAL FIELD

The invention relates to a door assembly having an anti-theft device and a method of assembling a door.

BACKGROUND OF THE INVENTION

A typical vehicle has at least one access door. Such a door typically has a latch mechanism actuated by an outside door handle to gain access to the interior of the vehicle. Vehicles are sometimes subject to unauthorized entry and theft. To prevent such unauthorized entry while permitting authorized access, on at least some of the vehicle doors the latch mechanism is provided with an externally actuated lock having a key cylinder rod. Attempts to gain unauthorized entry into the vehicle include triggering the door latch mechanism by forcibly manipulating the key cylinder rod in the door. An anti-theft device such as a shield may be placed in the door assembly to prevent unauthorized access or tampering of the key cylinder rod. The shield is typically attached within the door assembly via a fastener such as a threaded stud, thereby taking up packaging space and shifting the glass run channel by about 10 mm.

SUMMARY OF THE INVENTION

A door assembly having an anti-theft device is provided. A locating tab extends from the anti-theft device and is insertable in the cavity in the door component, thereby locating the anti-theft device relative to the door component. The door component includes a locking tab attached or integrally formed on the door component and adapted to snap into an opening in the anti-theft device, thereby securing the anti-theft device relative to the door component. The anti-theft device may be a shield and the door component may be a latch mechanism. Assembly of the shield is simplified with the elimination of the fastener typically used to secure anti-theft devices within the door assembly. Because the locating tab locates the shield relative to the door component, the operation of driving a small fastener to locate and secure the assembly is not required. Further, door packaging is improved by reducing space that is otherwise taken up by a typical fastener. A method of assembling a door is also provided.

The above features and advantages and other features and advantages of the present invention are readily apparent from the following detailed description of the best modes for carrying out the invention when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic perspective fragmentary view of a portion of a vehicle door in accordance with the present disclosure;

FIG. 2 is a schematic perspective fragmentary view of a shield shown in FIG. 1, showing the opposite side of the shield shown in FIG. 1; and

FIG. 3 is a close-up schematic perspective fragmentary view of a portion of the latch mechanism and shield shown in the door of FIG. 1;

FIG. 4 is a close-up schematic perspective fragmentary view of a portion of the latch mechanism shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, wherein like reference numbers refer to like components, FIG. 1 shows a portion of a vehicle door 10. The door 10 includes an exterior-facing member 12 and an exterior door-release handle 14, which are part of a handle assembly 16. The door 10 includes a latch mechanism 18, shown in FIG. 1. As understood by one of ordinary skill in the art, the latch mechanism 18 is capable of being fastened and released by door-release handle 14 as well as via an interior door-release handle (not shown) to permit the door 10 to selectively open and close the entryway 20. The latch mechanism 18 may be a unitary or one-piece configuration or may include a plurality of components. The door 10 also includes an inner structure (not shown) for supporting the exterior-facing member 12, the latch mechanism 18, and various wiring, reinforcement members and other door hardware, as known by those skilled in the art.

Referring to FIG. 1, a key-cylinder 22 is located on the door 10, such that the key-cylinder is accessible from the exterior-facing member 12. Key-cylinder 22 is operatively connected to latch mechanism 18 via a rod 24 (shown in phantom) at position 26 for selectively locking and unlocking latch mechanism 18. Key-cylinder 22 may be operatively connected to a pawl (not shown) that rotates when a key 28 is turned in the key-cylinder 22, thereby translating the rod 24 and selectively locking and unlocking latch mechanism 18. Alternatively, a remote keyless system may be used to lock and unlock the latch mechanism 18.

To prevent manipulation or jimmying of the key-cylinder 22 and rod 24 by a thief using an implement such as a screwdriver, an anti-theft device such as shield 30 is operatively connected to the exterior-facing member 12, as shown in FIG. 1. The shield 30 is positioned between the rod 24 and exterior-facing member 12. FIG. 2 is a schematic perspective view of the shield 30. For clarity, the shield 30 is shown shaded in FIGS. 1-3. Shield 30 includes first, second, third and fourth walls 32, 34, 36, 38 (shown in FIG. 2) configured to block physical access to the rod 24 from the exterior-facing member 12, shown in FIG. 1. Shield 30 includes a first aperture 40 for attachment to a door inner panel (not shown), a second aperture 42 for attachment to the handle assembly 16 and a third aperture 44 for attachment to the door inner panel (not shown). Suitable fasteners such as bolts or studs may be used to attach the apertures 40, 42, 44 to the respective components.

The shield 30 is attached to a door component, such as latch mechanism 18, through a locating and attachment mechanism 50, shown in FIGS. 1 and 3. Alternatively, the shield 30 may be attached to another door component, such as a bracket or panel (not shown), specially formed to have the features of the locating and attachment mechanism 50, shown in FIG. 3 and described below. FIG. 3 is a close-up schematic perspective fragmentary view of the portion 3 shown in FIG. 1. The locating and attachment mechanism 50 includes a door portion 52 (shown in FIG. 4) and a shield portion 54 (shown in FIG. 2).

The door portion 52 of the locating and attachment mechanism 50 is shown in FIG. 3. The door portion 52 includes an internally protruding cavity 56 (also shown in phantom in FIG. 3) formed on a first face 58 of the latch mechanism 18. The door portion 52 includes a locking tab 60 that is attached onto or integrally formed on a second face 62 of the latch mechanism 18. As shown in FIG. 4, the first face 58 is angled with respect to the second face 62. The first face 58 may be oriented approximately perpendicularly with respect to the

second face 62. Thus, referring to FIG. 2, application of a first force A (parallel to the axis 80 shown in FIG. 1) and a second force B, which are approximately perpendicular to each other, is needed to release the shield from the door component. The latch mechanism 18 may be composed of plastic, metal or other suitably rigid material. The latch mechanism 18 may be formed with the internally protruding cavity 56 and locking tab 60 using injection molding techniques. The latch mechanism 18 may also be hydroformed, stamped, cast, extruded or otherwise manufactured. The latch mechanism 18 may have a unitary or one-piece configuration or may be an assembly of components.

The shield portion 54 of the locating and attachment mechanism 50 is shown in FIG. 2. The shield portion 54 includes a locating tab 64 that is attached onto or integrally formed on the first wall 32 of the shield 30. The shield portion 54 includes a flange 66 having an opening 70 (shown in FIGS. 1-3). The flange 66 abuts and extends away from the first wall 32 and the second wall 34 of the shield 30, as shown in FIG. 2. The first wall 32 is angled with respect to the second wall 34. The first wall 32 may be oriented approximately perpendicularly with respect to the second wall 34. The locking tab 60 of FIG. 4 is adapted to fit or snap into the opening 70 in the shield 30, thereby securing the shield 30 relative to the latch mechanism 18. The locating tab 64 is insertable in the cavity 56 in the latch mechanism 18, thereby locating the shield 30 relative to the latch mechanism 18. The cavity 56 may be designed to have a shape that is substantially complementary to the locating tab 64. Optionally, the locating tab 64 may be tapered along its length, as shown in FIG. 2. The shield 30 may be composed of plastic, metal or other suitably rigid material to provide resistance to tampering of the door structure. The shield 30 may be formed having the locating tab 64 and opening 70 using injection molding techniques. The shield 30 may also be hydroformed, stamped, cast, fabricated, extruded or otherwise manufactured.

The locating and attachment mechanism 50 functions as follows: the locating tab 64 is partially inserted into the cavity 56 in the latch mechanism 18 before the locking tab 60 makes contact with the opening 70 in the shield 30. Referring to FIG. 3, the locating tab 64 protrudes into the cavity 56 in the latch mechanism 18 to locate the proper position of the shield 30 relative to the latch mechanism 18 as well as to retain the shield 30 in the latch mechanism 18. The opening 70 in the shield 30 is then positioned above the locking tab 60, causing the locking tab 60 to snap into place in the opening 70. The shield 30 is then fully assembled in the door 10, as shown in FIGS. 1 and 3.

Referring to FIG. 4, the locking tab 60 in the latch mechanism 18 has a first portion 72 that is tapered to allow for easy insertion in the opening 70 (shown in FIG. 3) in the shield 30 during assembly. The locking tab 60 has a second portion 74 that is raised above the second face 62 of the latch mechanism 18, as shown in FIG. 4. The second portion 74 allows the locking tab 60 to be secured in the opening 70 after assembly and prevents the locking tab 60 from being detached from the opening 70. The shield 30 may be removed from the latch mechanism 18 by applying a force to remove or un-snap the locking tab 60 from the opening 70. This would allow the locating tab 64 to be removed from the cavity 56 in the latch mechanism 18.

The locating and attachment mechanism 50 simplifies assembly of the shield 30 into the door 10 by eliminating the fastener (not shown) typically used to secure an anti-theft devices in a vehicle. Because the locating tab 64 locates the shield 30 to the latch mechanism 18, the blind operation of driving a small fastener to locate and secure the assembly is

not required. A typical fastener would shift the rear glass run channel (not shown) by approximately 10 mm. Door packaging is improved as space is not required for the typical fastener (along the axis 80).

While the best modes for carrying out the invention have been described in detail, those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the invention within the scope of the appended claims.

The invention claimed is:

1. A door assembly comprising:
 - a door component having a first face, a second face and an internally protruding cavity, the door component including a locking tab attached or integrally formed on the second face of the door component;
 - a shield having an opening and a locating tab extending from the shield;
 - wherein the first face of the door component defines the internally protruding cavity;
 - wherein the first face is oriented approximately perpendicularly with respect to the second face, the first face being directly adjacent to the second face;
 - wherein the entire locating tab is insertable in the cavity in the door component, thereby locating the shield relative to the door component;
 - wherein the locking tab is directly attached to the second face of the door component and
 - wherein the locking tab is adapted to extend through the opening in the shield, the locking tab being configured to secure the shield relative to the door component.
2. The assembly of claim 1, wherein the door component is a latch mechanism.
3. The assembly of claim 1, wherein the locking tab has a first portion that is tapered to allow the entire locking tab to be inserted through one end of the opening and extend through the opposite end of the opening in the shield.
4. The assembly of claim 1, wherein the locking tab has a second portion that is raised relative to the second face of the door component to secure the locking tab in the opening in the shield, the second portion being configured to extend in a direction substantially perpendicular to the cavity of the door component.
5. The assembly of claim 1, wherein the shield is positioned between an exterior-facing member and a rod operatively connected to a key cylinder for unlocking the door assembly; and
 - wherein the shield includes at least one wall configured to block access to the rod from the exterior-facing member.
6. The assembly of claim 1, wherein the shield is formed from a plastic material.
7. The assembly of claim 1, wherein:
 - the shield includes first and second walls, the first wall being angled with respect to the second wall;
 - the locating tab extends from the first wall; and
 - the opening in the shield is formed on a flange abutting the first wall and the second wall.
8. The assembly of claim 7, wherein the first wall is oriented approximately perpendicularly with respect to the second wall.
9. A vehicle comprising:
 - an entryway;
 - a door assembly for the entryway, the door assembly having:
 - an exterior-facing member;
 - a latch mechanism operatively connected to the exterior-facing member,
 - the latch mechanism having a first and a second face;

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wherein the first face is oriented approximately perpendicularly with respect to the second face, the first face being directly adjacent to the second face;
 an internally protruding cavity defined by the first face of the latch mechanism;
 a shield defining an opening and operatively connected to the latch mechanism;
 a locating tab extending from the first wall of the shield such that the entire locating tab is insertable in the cavity in the latch mechanism, thereby locating the shield relative to the latch mechanism;
 a locking tab integrally formed on the second face of the latch mechanism and adapted to extend through the opening in the shield, the locking tab being configured to secure the shield relative to the latch mechanism;
 wherein the locking tab is directly attached to the second face of the door component and
 wherein the locking tab defines a second portion that is raised to secure the locking tab in the opening in the shield, the second portion being configured to extend in a direction substantially perpendicular to the cavity of the latch mechanism.

10. The vehicle of claim **9**:
 wherein the shield is positioned between the exterior-facing member and a rod operatively connected to a key cylinder for unlocking the door; and
 the shield includes at least one wall configured to block access to the rod from the exterior-facing member.

11. The vehicle of claim **9**, wherein the opening in the shield is formed on a flange abutting a first wall and a second wall of the shield, the first wall being oriented approximately perpendicularly with respect to the second wall.

12. The vehicle of claim **9**, wherein:
 the locking tab defines a first portion that is tapered to allow the entire locking tab to be inserted through one end of the opening and extend through the opposite end of the opening in the shield.

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13. A method of assembling a door, the method comprising:
 forming a door component with an internally protruding cavity, wherein the cavity is a blind hole;
 wherein the door component includes a first face and a second face, the internally protruding cavity being defined by the first face;
 wherein the first face is oriented approximately perpendicularly with respect to the second face, the first face being directly adjacent to the second face;
 forming a shield having an extending locating tab and forming an opening in the shield on a flange abutting a first wall and a second wall of the shield;
 inserting the entire locating tab of the shield into the cavity in the door component, thereby locating the shield to the door component;
 directly attaching or integrally forming a locking tab on the second face of the door component; and
 fitting the locking tab into the opening in the shield such that the locking tab extends through the opening, the locking tab being configured to secure the shield relative to the door component.

14. The method of claim **13**, further comprising:
 forming a first portion on the locking tab that is tapered to allow the entire locking tab to be inserted through one end of the opening and extend through the opposite end of the opening in the shield;
 forming a second portion on the locking tab that is raised to secure the locking tab in the opening in the shield, the second portion being configured to extend in a direction substantially perpendicular to the cavity of the door component.

15. The assembly of claim **1**, wherein the cavity of the door component is a blind hole.

16. The vehicle of claim **9**, wherein the cavity defined by the latch mechanism is a blind hole.

* * * * *